School learning ~~versus~~ & Life learning:

The interaction of spontaneous & scientific concepts in the development of higher mental processes

by Paula Wellings

In order to understand the role that school plays in our lives, there is a body of research that attempts to isolates formal school experiences from everyday life experiences in order to compare and measure the effects that each has on human intellectual development and daily activities. (Schliemann & Acioly, Nisbett et al., Ceci & Ruiz, Lave, J.) One general finding from this research is that school learning is relevant to other school learning, and everyday life learning is relevant to everyday life. To gain further insight into what other possible relationships exist between the concepts developed in school learning and those developed in everyday life learning, I will be exploring Vygotsky's theory of the development of higher level thinking and concept formation. Specially, I will be looking at how concepts acquired in school learning and in everyday life relate and potentially interact within the Vygotsky's zone of proximal development to foster the development of superordinate concepts.

What is a concept?

When Vygotsky refers to a concept, there is an implicit differentiation of **the concept** from lesser formed structures such as syncretic images, complexes, and pseudo concepts. Additionally, Vygotsky's view of conceptual transfer in constrained to the actions of adolescents and adults. With these restrictions set upon our understanding of the concept, it is useful to contemplate the broader system within which Vygotsky considered individual concepts to operate.

> "If we imagine the totality of concepts as distributed over the surface of the globe, the location of every concept may be defined by means of a system of coordinates, corresponding to longitude and latitude in geography. One of these coordinates will indicate the location of a concept between the extremes of maximally generalized abstract conceptualization and the immediate sensory grasp of an object—i.e., its degree of

> concreteness and abstraction. The second coordinate will represent the objective reference of the concept, the locus within reality to which it applies. Two concepts applying to different areas of reality but comparable in degree of abstractness—e.g., plants and animals—could be conceived of as varying in latitude but having the same longitude.
>
> The "longitude" of concepts will, thus, be the characteristic of thought processes, while the "latitude" will be the characteristic of their objective reference. These two parameters must be sufficient to provide exhaustive information on the nature of a concept. The "coordinates" of a concept determine all relations of the given concept to others, i.e., to its coordinate, superordinate, and subordinate concepts. This position of concept within the total system of concepts may be called its *measure of generality.* (Vygotsky, Thought and Language, p.199-200)

In this manner, Vygotsky describes concepts as being part of a system of representation encompassing both levels of abstraction and degrees of relatedness to a reality constructed of other concepts. This multidimensional representation supports the development of interlinked hierarchies that rely on existing concepts to facilitate the instantiation of new concepts.

Vygotsky embeds and constrains the total system of concepts within the operation of verbal thinking—perceptual thought processes mediated through the use of language. The distinction of concepts existing within a dynamic system of language and perception differentiates Vygotsky's theory of higher order thinking from the model proposed by Thorndike, who advocated a theory of intelligence represented by increasingly complex levels of unmediated stimulus and response pairs.

> The structure of signification, which plays a formative role in all higher types of behavior, does not coincide with the associative structure of elementary processes. The quantitative growth of the associative connections would never lead to higher intellectual activity.
>
> The process of concept formation, like any other higher form of intellectual activity, is not a quantitative overgrowth of the lower associative activity, but a qualitatively new type. Unlike the lower forms, which are characterized by the immediacy of intellectual processes, this new activity is mediated by signs. (T&L, p. 109)

This qualitatively different activity provides our first clue to how Vygotsky accounts for the relationships formed between concepts. Unlike Thorndike's stimulus and response theory of intelligence, mediation of activity by conceptual signs introduces a system of concepts that operates through socially meaningful relational bonds.

Vygotsky's general model of concept formation

Vygotsky considers conceptual formation to be an iterative and dynamic activity. "A concept emerges and takes shape in the course of a complex operation aimed at the solution of some problem...A concept is not an isolated, ossified, and changeless formation, but an active part of the intellectual process, constantly engaged in service communication, understanding and problem solving." (T&L)

Concept formation takes place through the interaction of language and other signs with the immediacy of perceptual intellectual processes. The use of language becomes the mechanism through which the child focuses his or her attention, and is able to select distinctive features within the environment and analyze and synthesize them. The perceptual processes are the in-the-moment activities that constitute association, attention, imagery and judgment, and their determining of tendencies. Together the intertwining of these capacities drives the process of conceptual development from early childhood to adulthood, and exemplify the ongoing back and forth movement between abstract and concrete reality.
Through a series of experiments where children, adolescents and adults sorted objects according to some criterion, Vygotsky identified three broad phases in the process of concept formation: 1)the formation of syncretic heaps, 2)thinking in complexes, and 3)concept formation.

Phase One: Syncretic images play the role of "concepts"

The first phase of concept development is characterized by "incoherent coherence". In this phase, the child relies on their own perception to make sense of objects that appear to them to be unrelated. Relying on trial and error activities,

the organization of their own visual field and perceptions of time and space, and a synthesis of these two techniques the child creates his or her own subjective relationships between objects and then mistakes his or her egocentric perspective for reality.

Phase Two: Thinking in Complexes

Vygotsky characterizes thinking in complexes as follows:

> The principle function of complexes is to establish bonds and relationships. This begins with the unification of scattered impressions; by organizing discrete elements of experience into groups. This creates the basis for later generalizations. (T&L, p.135)

In contrast to the first phase, a child thinking in complexes is less egocentric in his or her organization scheme. As well as incorporating his or her own subjective and perceptual criteria to the organization of the objects, the child in this stage has access to additional experientially-based complex structures which enable them to utilize both perceptual and actual conceptual bonds between the objects. Vygotsky identifies five types of complexes that demonstrate the different approaches the child takes to developing systems of meaning for the objects. These complexes include:

- **Associative:** systems based on similarities or other perceptual compelling ties between things
- **Collections:** systems based on relations between objects observed in practical experience
- **Chain**: the structural center of the system may be absent all together, ending of chain may have nothing in common with the beginning, (i.e. young children's story telling)
- **Diffuse**: systems based on indeterminate bonds based on generalizations in the non-practical and non-perceptual areas
- **Pseudo-concept: a** system that may confound differentiation between complexes and concepts as the system appears phenotypically similar

to that of a concept. An example of a pseudo-concept in action in the use of words by a child when communicating with an adult.

> The child learns very early a large number of words that mean the same to him and to the adult. The mutual understanding of adult and child creates the illusion that the end point in the development of word meaning coincides with the starting point, that the concept is provided ready-made from the beginning, and that no development takes place. (T&L, p. 121)

In this case, it might be assumed that the child has qualitatively similar thought to that of the adult. However, further investigation in to the child's comprehension of word meaning reveals any number of complex associations.

It is valuable to consider the nature of these complexes as they represent the strategies children utilize when attempting to assimilate culturally embedded concepts embedded within both school and everyday activities. Vygotsky states that, "in real life complexes corresponding to word meaning are not spontaneously developed by the child. The lines along which a complex develops are predetermined by the meaning a given word already has in the language of adults. (T&L, p.120) Through the use of complexes, the child is utilizing behavioral and intellectual interactions with the world to develop relevant structures for engagement.

Phase Three: Thinking in Concepts—scientific and spontaneous

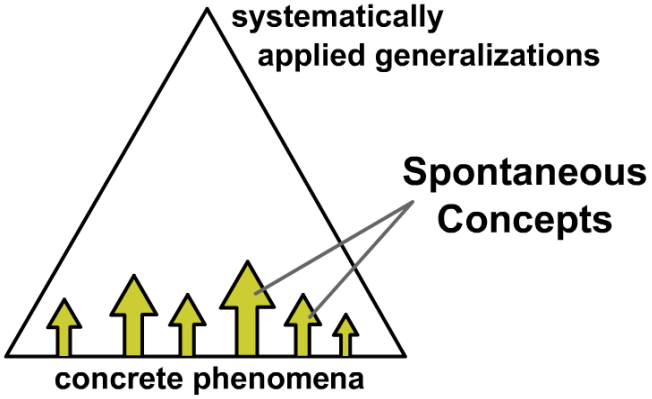
Vygotsky considers there to be two main types of concepts, spontaneous and scientific. The unique aspects of the development of each concept will be explored in the sections that follow. Common characteristics of both types of concepts center on the nature of their acquisition.

> "Direct teaching of concepts is impossible and fruitless. The path from the first encounter with a new concept to the point where the concept and the corresponding word are fully appropriated by the child is long and complex." (T&L)

According to Piaget—and Vygotsky agrees—both spontaneous and non-spontaneous concepts:

- resist suggestion
- have deep roots in the child's thinking
- appear in more or less similar forms in children of the same age
- have a long life in the child's minds and die out gradually, unlike the "suggested concepts" which disappear instantly
- reveal themselves in the first correct answers of the child
- the mere presence of external conditions favoring a mechanical linking of word and object does not suffice to produce a concept (T&L)

Life learning
the development of spontaneous concepts



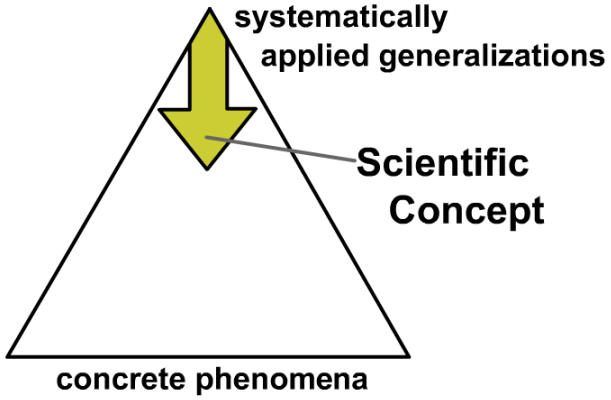
The first type of concepts that Vygotsky identifies are spontaneous concepts, derived from people's direct experience with the world. The development of spontaneous concepts can be considered an inductive process. Grounded in the concrete activities of every day life, spontaneous concepts are formed through the aggregation and synthesis of lived experience. Similar to the process of inductive reasoning, the development of spontaneous concepts is dependent on pattern

recognition, comparisons made between multiple events, reflection on activities, and the use of analogical reasoning. Vygotsky identifies spontaneous concepts as "strong in what concerns the situational, empirical, and practical." (T&L, p. 194)Conversely, spontaneous concepts are difficult to reason with, as forming abstractions in an inductive manner is a laborious and inexact process. Vygotsky provides the example of a child's knowledge of the concept of brother, and his challenges with using this concept in an abstracted context:

> A child's everyday concept, such as "brother," is saturated with experience. Yet, when he is asked to solve an abstract problem about a brother's brother, as in Piaget's experiments, he becomes confused. On the other hand, though he can correctly answer questions about "slavery," "exploitation," or "civil war," these concepts are schematic and lack the rich content derived from personal experience. (T&L, p. 192-193)

Spontaneous concepts reflect the folk-wisdom, common-sense, and everyday beliefs and understandings that people live with but rarely articulate.

School learning
the development of scientific concepts



In contrast to spontaneous concepts, the development of scientific concepts can be considered a deductive process. In this process the child is exposed, within a structured school environment, to the abstracted conceptual knowledge of their culture. With the assistance of a teacher or more knowledgeable peer, the child is

challenged with instantiating these concepts, such that they can provide utility to the child.

Reflecting on Vygotsky's model, Wells defines scientific concepts in comparison to everyday or spontaneous concepts as follows:

> Where as everyday concepts are related to the world of experience in a direct but relatively ad hoc manner, scientific concepts are both more abstract and more general; their primary relationship is to other concepts within the relevant system and only indirectly to the particular objects and events that they subsume. (Wells, 1994)

Wells identifies four main features that distinguish scientific concepts. These features include generality, systematic organization, conscious awareness and voluntary control. Generality and systematic organization refer to the characteristics of scientific concepts that structurally differentiate them from spontaneous concepts. Conscious awareness and voluntary control refer to the manner in which scientific concepts are acquired and utilized. For Vygotsky, structured and systematic instruction in a school setting is crucial to the child's acquisition of scientific concepts. He sees the strength of these concepts as their conscious and deliberate character and sees the internalization process as requiring an environment with a similar character.

Reflecting more broadly, Vygotsky's theory of internalization locates a child's cultural development in the external social environment before migrating to the internal environment of the child's mind.

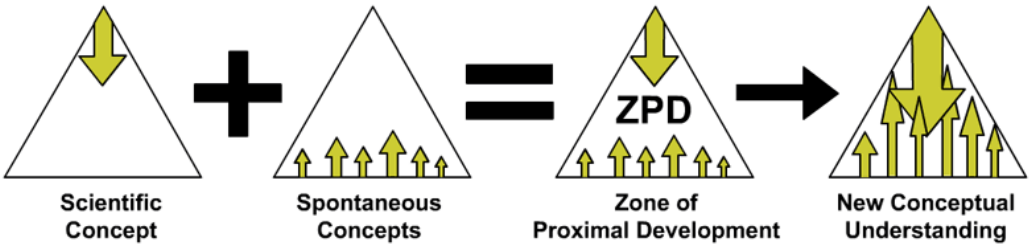
> Any function in the child's cultural development appears twice, or on two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an interpsychological category, and then within the child as an intrapsychological category. This is equally true with regard to voluntary attention, logical memory, the formation of concepts, and the development of volition…..
> …[I]t goes without saying that internalization transforms the process itself and changes its structures and functions. Social relations or relations

> among people genetically underlie all higher functions and their relationships. (Vygotsky, 1981b, p. 163)

Given Vygotsky's perspectives on inter and intra psychological processes, the structured social and curricular environment of the school represents the future internal conceptual acquisition of the child.

The relationship between school learning and life learning: The interaction of spontaneous and scientific concepts

Scientific concepts grow downward through spontaneous concepts; spontaneous concepts grow upward through scientific concepts."(T&L p.194)



Spontaneous and scientific concepts play an interdependent role in the development of superordinate concepts. While spontaneous concepts begin in the concrete phenomena of every day life and scientific concepts begin with abstracted verbal definitions, one does not replace the other in concept formation.

> ...systematicity and consciousness do not come from outside, displacing the child's spontaneous concepts, but that, on the contrary, they presuppose the existence of rich and relatively mature representations. Without the latter, the child would have nothing to systematize. Systematic reasoning, being initially acquired in the sphere of scientific concepts, later transfers its structural organization into spontaneous concepts, remodeling them "from above". The interdependence between spontaneous and scientific concepts stems from the special relations existing between the scientific concept and the object. In the scientific concepts that the child acquires in school, the relation to an object is mediated from the start by some other concept. Thus, the very notion of scientific concept implies a certain position in relation to other concepts, i.e., a place within a system of concepts. (T&L, p. 172)

Vygotsky illustrates this concept interdependence through the example of learning historical (scientific) concepts. In his example, a prerequisite to the

comprehension of historical concepts is a base understanding of the past, present, and future. Without access to these spontaneous concepts of temporality, the child is unable to grasp the meaning of history. In this manner, "the development of a spontaneous concept must have reached a certain level for the child to be able to absorb a related scientific concept." (T&L, pg 194)

While the development of spontaneous concepts is required to facilitate the absorption of scientific concepts, scientific concepts provide the systems of meaning and the frameworks for new understanding that change the structure and organization of spontaneous concepts. Vygotsky's zone of proximal development theory determines how generative interaction between spontaneous and scientific concepts can occur.

> Spontaneous concepts that confront a deficit of conscious and volitional control find this control in the zone of proximal development, in the cooperation of the child with the adult. That is why it is essential first to bring spontaneous concepts up to a certain level of development that would guarantee that the scientific concepts are actually just above the spontaneous ones. (T&L, p. 194-195)

Interactions within the zone of proximal development, change the child's relationship to both his or her existing spontaneous and scientific concepts, facilitating a level of metacogntion and self-reflection previously inaccessible.

> The child becomes conscious of his spontaneous concepts relatively late; the ability to define them in words, to operate with them at will, appears long after he has acquired the concepts. He has the concept (i.e., knows the object to which the concept refers), but is not conscious of his own act of thought. The development of a scientific concept, on the other hand, usually *begins* with its verbal definition and its use in nonspontaneous operations—with working on the concept itself. It starts its life in the child's mind at the level that his spontaneous concepts reach only later. (T&L, p.192)

As instruction precedes development in this model, it is important to realize that when a student first learns a scientific concept that development of that concept has not been completed but rather only initiated.

> "..the development process lags behind the learning process; this sequence then results in zones of proximal development. Our analysis alters the traditional view that at the moment a child assimilates the meaning of the word, or masters an operation such as addition or written language, her development is basically completed. In fact, they have only just begun at that moment. the major consequence of analyzing the education process in this manner is to show that the initial mastery of, for example, the four arithmetic operations, provides the basis for the subsequent development of a variety of highly complex internal processes in children's thinking. (Mind in Society, p.90)

My conclusions

Reflecting on my exploration of Vygotsky's theory of the development of higher level thinking and concept formation, I leave this experience with a number of thoughts for further consideration.

1. **The zone is different**

   Before this time, I had not specifically considered the role of the adult in the zone of proximal development as a guide to assist the child in building new conceptual understandings through the linking of existing spontaneous and scientific concepts.

2. **The relationship between pseudo concepts and concepts complicates our understanding of meaningful behavior**

   Vygotsky's explanation of the role of pseudo concepts in conceptual development helped me to frame phenomena I have observed in association with test taking. Specifically, the notion of the pseudo concepts helps me to understand how students who can "cram" for a test—successfully lodging the language of a domain into memory, can perform in ways that appear meaningful on the test, and then have little ability to use this school knowledge in any other circumstance, school or life oriented.

3. **The combining of school and life experiences has the potential to be developmentally significant**

According to Vygotsky, the development of higher order concepts is dependent on the interaction of spontaneous and scientific concepts. This dependence shifts the notion of *nice-to-have-a-little* everyday life in the school or *nice-to-have-a-little* school in everyday life. To facilitate higher level thinking children must have access to zones of proximal development that maximize the meaningful interaction of existing school and life concepts.

4. **Concept development takes time**

   The time scale in which Vygotsky places concept development is much longer than the time scale represented in many experiments I have encountered within educational research. This perspective on concept formation will influence how I read educational research as well has how I might attempt to measure conceptual development and change in the future.

5. **The environment matters**

   Vygotsky asserts that the structure of our social conditions construct the structures of our internal thought processes and that internal thought processes are first experienced and mediated through the social environment. This idea is consequential to how I look at both school and everyday environments and their potential relationship to conceptual development.

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